# PATENT ABSTRACTS OF JAPAN

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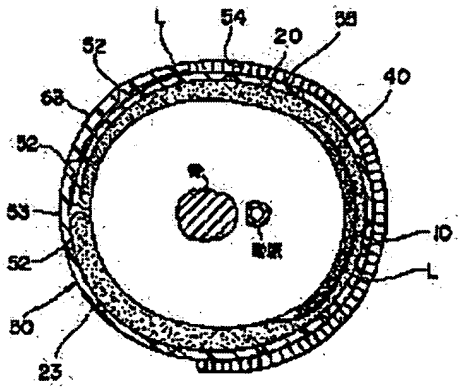
## (54) HEMOMANOMETER AND PRESSURE CUFF & BAG THEREOF



(57)Abstract:

PURPOSE: To provide a hemomanometer and a pressure cuff & bag thereof which makes measured values free from effect of a circumferential length of an arm and the width of the pressure cuff & bag to allow accurate measurement of a blood pressure.

CONSTITUTION: This pressure cuff & bag of a hemomanometer is shaped in a belt as a whole and wound on an upper arm to block an arterial bloodstream. This is provided with an inner pressure cuff & bag 10 small relatively to press the artery. an outer pressure cuff & bag 20 which has the inner pressure cuff & bag 10 arranged almost at the center thereof to be wound on the arm, a less viscous leading liquid L to be supplied into or discharged from both the pressure cuff & bags 10 and 20 a pressure sensor which is arranged in the inner pressure cuff & bag 10 to detect changes in pulse wave to be propagated through the leading liquid and in the internal cuff & bag pressure being overlapped and a vibration shielding plate 40 which is interposed between the pressure sensor and the outer pressure cuff & bag 20 to shield the propagation of vibrations as probable disturbance to the inner pressure cuff & bag 10 through the outer pressure cuff & bag 20.



LEGAL STATUS

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CLAIMS

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[Claim(s)]
[Claim 1] The comparatively small inner cuff which is a cuff of the sphygmomanometer with which the whole is beltlike with a sphygmomanometer, is twisted around an overarm, and carries out ischemia of the artery style, and presses an artery, The outer cuff which arranges said inner cuff in the center of abbreviation, and is twisted around an arm, The pressure sensor which superimposes and detects change of the conduction liquid of low viscosity by which feeding and discarding are carried out according to an individual into said both cuffs, the pulse wave which is arranged in said inner cuff and spread through said conduction liquid, and cuff internal pressure, The cuff characterized by having the oscillating shield which intercepts propagation of the pulse wave to the inner cuff which intervened between said sensors and outer cuffs and minded the outer cuff.
[Claim 2] The sphygmomanometer characterized by having a judgment means to determine the diastole (minimum) blood pressure of blood pressure, and contraction stage (max) blood pressure from the digital output signal of the conduction liquid feeding-and-discarding means to a cuff according to claim 1, and an inner cuff and an outer cuff, the differential circuit which differentiates the output signal of a pressure sensor, the A/D converter which changes the output signal of said differential circuit, or the input signal to said differential circuit into a digital signal, and said A/D converter, or the digital output signal of a differential circuit.
[Claim 3] Said judgment means is a sphygmomanometer according to claim 2 characterized by judging blood pressure just before it made blood pressure when a flat part arises between contiguity pulses in a continuous arterial-wave form into diastole (minimum) blood pressure and the arterial-wave form became zero as contraction stage (max) blood pressure.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Industrial Application] There are the view blood type which measures the pressure in a blood vessel directly, and bloodless [ which are measured based on change of the pulsation of a blood vessel changed into the ischemia condition ] in blood pressure measurement, and this invention relates to a bloodless sphygmomanometer and its cuff.
[0002]
[Description of the Prior Art] With the conventional bloodless sphygmomanometer, for example, an oscillograph metric type sphygmomanometer, air was supplied to the ********** saccate cuff of rubber, the blood vessel was made into the ischemia condition, the pressure of a cuff and arterial-blood-pressure fluctuation were superimposed and detected on the assumption that the pressure in a cuff was equal to artery compression pressure, and as compared with the clinical data currently beforehand asked for this, the highest or the lowest blood pressure is determined in rule of thumb.
[0003]
[Problem(s) to be Solved by the Invention] However, approximation-like [ the blood pressure obtained in the conventional bloodless sphygmomanometer compared with the view blood type ] strictly. For this reason, by the time it computes the highest or the lowest blood pressure, various kinds of storage, a judgment, and data processing are required, and structure needs many processes until it is complicated and blood pressure can be found. For example, a comparison calculation means with the memory for clinical data and clinical data etc. is indispensable, and a configuration is very complicated. Moreover, since there are many processes, before blood pressure can be found, time amount will be taken, and since the ischemia condition by the cuff is continued by the operating personnel-ed in the meantime, it is accompanied by pain.
[0004] moreover, the backlash measurement error which is the air to which the cuff for the conventional sphygmomanometers has structure which sends in air in a cuff and carries out ischemia of the blood vessel, and a pulsating transfer medium is rich in compressibility -- being generated -- easy -- current -- if it uses for the man of 32cm or more of overarm peripheries using a cuff with a width of 13cm made proper, actually more high blood pressure will be measured, and when it uses for the man of 28cm or less of overarm peripheries on the other hand, it is in the inclination measured actually more low.
[0005] This invention was not made in view of the trouble of said conventional technique, and the purpose has measured value in it not being influenced of the arm perimeter and cuff width, but offering the possible sphygmomanometer and cuff of exact blood pressure measurement.
[0006]
[Means for Solving the Problem] In the cuff which starts claim 1 in order to attain said purpose The comparatively small inner cuff which is a cuff of the sphygmomanometer with which the whole is beltlike with a sphygmomanometer, is twisted around an overarm, and carries out ischemia of the artery style, and presses an artery, The outer cuff which arranges said inner cuff in the center of abbreviation, and is twisted around an arm, The pressure sensor which superimposes and detects change of the

conduction liquid of low viscosity by which feeding and discarding are carried out according to an individual into said both cuffs, the pulse wave which is arranged in said inner cuff and spread through said conduction liquid, and cuff internal pressure, It intervenes between said sensors and outer cuffs, and has the oscillating shield which intercepts propagation of the pulse wave to the inner cuff through an outer cuff.

[0007] In the sphygmomanometer concerning claim 2 Moreover, the conduction liquid feeding-and-discarding means to a cuff according to claim 1, and an inner cuff and an outer cuff, The transducer which changes the output signal of a pressure sensor into an electrical signal, The differential circuit which differentiates the output signal of a transducer, and the A/D converter which changes the output signal of said differential circuit, or the input signal to said differential circuit into a digital signal, It has a judgment means to determine the diastole (minimum) blood pressure of blood pressure, and contraction stage (max) blood pressure, from the digital output signal of said A/D converter, or the digital output signal of a differential circuit.

[0008] Moreover, in the sphygmomanometer concerning claim 3, and its cuff, said judgment means judges blood pressure just before it made blood pressure when a flat part arises between contiguity pulses in a continuous arterial-wave form into the inside of diastole (minimum) blood pressure and the arterial-wave form became zero as contraction stage (max) blood pressure.

[0009]

[Function] The inner cuff backed up by the outer cuff presses an artery certainly, it considers as an ischemia condition, and a pressure sensor serves as a location which stands face to face against the ischemia section of an artery. And pulsation of an artery and the pressure fluctuation in an inner cuff are exactly spread to a pressure sensor through the nonviscous conduction liquid in an inner cuff (incompressibility). The signal which serves as disturbance transmitted to an inner cuff side from an outer cuff side is intercepted by the oscillating shield.

[0010]

[Example] Next, the example of this invention is explained based on a drawing. The block diagram in which drawing 1 -6 show the sphygmomanometer which is one example of this invention, the sectional view in the condition that drawing 1 equipped the overarm with the cuff, and drawing 2 show the horizontal sectional view (sectional view in alignment with line II-II shown in drawing 1 ) of this condition, and drawing 3 shows the configuration of the whole sphygmomanometer, the internal-block Fig. of CPU whose drawing 4 is a blood-pressure judging means, drawing in which drawing 5 shows a pulse wave form, and drawing 6 are the flow charts in the blood-pressure judging of CPU.

[0011] In these drawings a sphygmomanometer The inner cuff 10 for arterial-blood-pressure Hasama, The pressure sensor 16 which the outside of the inner cuff 10 is prepared in the wrap outer cuff 20 and the inner cuff 10, and superimposes and detects a pulse wave and cuff internal pressure, The feeding-and-discarding means 30 which consists of a pump 31 which carries out the feeding and discarding of the conduction liquid to both the cuffs 10 and 20, respectively, and tubes 32 and 33, It mainly consists of an oscillating shield 40 by which adhesion immobilization was carried out at the outside surface of the inner cuff 10, and a processing circuit 50 which processes the output which the pressure sensor 16 detected and asks for diastole (minimum) blood pressure and contraction stage (max) blood pressure.

[0012] It is set to an overarm so that an artery may be crossed the inner cuff 10 being used as saccate, and the pressure sensor 16 formed in the cuff 10 interior detects pulsating change of an artery with the pressure in the inner cuff 10 (compression pressure). Since the outer cuff 20 presses the inner cuff 10 on an arm, it is not required that ischemia should be carried out only for itself [ inner cuff 10 ]. The appearances of the inner cuff 10 are the shape of a rectangle (long [ as an example / 3cm wide, 6cm (long) ]), and bag structure, and the inside (adhesion-on arm side) quality of the material uses the high vinyl chloride of flattery nature, and, thereby, is good. [ of the transmissibility of vibration of a pulse wave ] Moreover, the flattery nature currently generally used is formed in this kind of cuff of small a little thick vinyl chloride, and the quality of the material of the outside of the inner cuff 10 is effective at Kami who prevents propagation of vibration used as disturbance, such as a pulse wave spread through the outer cuff 20.

[0013] The appearance of the outer cuff 20 is band-like bag structure with a width of 13cm, the inside and an outside are formed of the small vinyl chloride of elasticity, and the feeding and discarding of the conduction liquid are carried out to the interior. Moreover, in the inner cuff 10, the outer cuff 20 is formed according to an individual, and has the operation which backs up the inner cuff 10 and carries out ischemia of the artery style. The conduction liquid L supplied to the inner cuff 10 and the outer cuff 20 has low viscous and incompressible pure water, silicone oil, liquid chlorofluocarbon, usable alcohol, etc. as a liquid with convective [ of pulsation / good ].

[0014] A pressure sensor 16 is diaphram structure, the electrical signal corresponding to pressure variation is outputted, transducer 16a changed into an electrical potential difference is built in, and it is held in the outer cuff 20 side in the inner cuff 10 in consideration of wiring of lead wire 18 in order to secure ischemia. The oscillating shield 40 was formed in 3cm wide and about 6cm long by the product made of resin, is not to transmit vibration used as disturbance, such as pulsation from the outer cuff 20 side, to the pressure sensor 16 in the inner cuff 10, and is pasted up on the outside of the inner cuff 10 so that the inner cuff 10 may be covered. Unnecessary signals other than pulsation required for blood pressure measurement and compression pressure are also detected to coincidence, and after that, although it had become the structure which eliminates an unnecessary signal to a blood-pressure judging, since vibration (signal) which acts on the pressure sensor 16 in the inner cuff 10 as disturbance is intercepted by existence of this oscillating shield 40, only a signal required for a blood-pressure judging is conventionally detectable by this example.

[0015] A pump 31 carries out the feeding and discarding of the conduction liquid L to the inner cuff 10 and the outer cuff 20 through tubes 32 and 33, respectively, and can consider electromagnetic, an air type, etc. The tube 32 which connects the outer cuff 20 with a pump 31 branches on the way, and the thin tube 33 prolonged from this tee is connected to the inner cuff 10. That is, while the tube 32 which connects the inner cuff 10 and the outer cuff 20 is made fine, tubes 32 and 33 are formed according to the small quality of the material of flattery nature, for example, polyethylene, and it is hard to come spread the pulsation spread to the outer cuff 20 to the inner cuff 10 through the inside of a tube 32 and 33.

[0016] The flexible covering 50 with which adhesion immobilization of the edge was carried out at the outer cuff 20 is formed in the outside of the outer cuff 20. This covering 50 is the structure where the pieces 53 of the strip made of resin were formed successively at equal intervals through the light-gage hinge region 52, and can be easily transformed into cylindrical. Moreover, the piece-of-Velcro section currently formed in the other end side of covering 50 is shown, the hair transplantation field 55 of the outside surface of covering 50 is pasted, covering 50 carries out envelopment adhesion at the peripheral face of the outer cuff 20, prevents the deformation to the outside of the outer cuff 20, and a sign 54 has the work which raises the ischemia operation by the outer cuff 20.

[0017] Drawing 3 is the block diagram showing the whole sphygmomanometer configuration, and the output (analog signal) of a pressure sensor 16 is amplified by the amplifier 17, it is changed into a digital signal by A/D converter 18, and is inputted into CPU19 which is the data-processing section. CPU19 is connected to 19d of switches which display RAM19a which can be written, ROM19b which can memorize data, the diastole (minimum) blood pressure computed based on the blood-pressure data inputted from A/D converter 18, and this blood-pressure data, contraction stage (highest) blood pressure, etc., such as indicator 19c, a pressurization switch, and an electric power switch. In addition, CPU19 is connectable also with external material machine 19e, such as a personal computer. A sign 34 is a pump drive circuit, and it operates in order to make a pump 31 drive based on the signal from CPU19.

[0018] Drawing 4 is the internal-block Fig. of CPU19, a sign 61 is a differential circuit and the output of this differential circuit 60 serves as an output wave as shown in the drawing 5 sign A. A sign 62 is the 1st comparator circuit and is outputted to an absolute-value circuit 63 here. In this circuit, a differential value is made into an absolute value and the output wave of this circuit 63 turns into an output wave as shown in the drawing 5 sign B. Furthermore, the output of a circuit 63 is outputted to the 2nd comparator circuit 64, and the absolute value of a differential value is compared [ whether it is zero or more and ]. Moreover, 0 responds for whether being no and, as for the output of this circuit 64, an

absolute value is alternatively outputted to the distinction circuits 65 and 66. In a circuit 65, it distinguishes whether the absolute value of a differential value is 0 of the beginning, and at the time of YES, it is outputted to a store circuit 67 and DBP (diastolic blood pressure) is memorized here. On the other hand, in a circuit 66, it distinguishes whether 0 which is the absolute value of a differential value continued for 2 - 3 seconds, and at the time of YES, it is outputted to a store circuit 67 and SBP (systolic blood pressure) is memorized here.

[0019] Moreover, drawing 6 shows the flow chart in the blood-pressure judging of CPU19. In step 70, A/D conversion is carried out first, and it shifts to step 71 which is a differential circuit 61. At this step 71, while differentiating data, difference deltaVi with the data which carried out A/D conversion before one is computed. And it shifts to step 72 which is the 1st comparator circuit 62. At this step 72, it distinguishes whether it is forward, and in a forward case, deltaVi shifts to step 74 which is the 2nd comparator circuit 64 (as shown in the sign a in drawing 5 , when the inclination of a pulse wave is forward). On the other hand, when deltaVi is negative, it shifts to step 73 which is an absolute-value circuit 63 (as shown in the sign b in drawing 5 , when the inclination of a pulse wave is negative), the absolute value of data is taken here, and it shifts to step 74 which is the 2nd comparator circuit. At step 74, |deltaVi| distinguishes whether it is forward, and if it is forward, it will return to step 70. On the other hand, in step 73, it shifts to step 75 at the time of |deltaVi|=0. At step 75, it distinguishes whether it began and was set to deltaVi=0, if it is YES, the cuff pressure at this time will be set to DBP (diastolic blood pressure), and it shifts to step 72 which is a store circuit, this DBP is memorized, and it returns to step 70 again. On the other hand, when deltaVi=0 is the 2nd more than time in step 75, it shifts to step 76 which is the distinction circuit 66, and distinguishes whether deltaVi=0 is continuing more than several seconds (2 - 3 seconds). And if it is YES, the last cuff pressure at the time of deltaVi>0 will be set to SBP (systolic blood pressure), it shifts to step 78, this SBP is memorized, and a judgment is completed.

[0020] Drawing 5 is drawing showing the inner cuff pressure and view blood blood-pressure wave between contraction blood-pressure (SBP) order fields, and the pulse wave form of an inner cuff from a diastolic blood pressure (DBP). The pulse wave form where a view blood blood-pressure wave and Sign D appear [ Sign C ] in an inner cuff in in this drawing, and Sign E are inner cuff pressures. And below by DBP, although the pulse wave form D appears continuously, since a pulse wave form lower than the inner cuff pressure force E is omitted, between SBP from DBP, the pulse wave form D serves as discontinuity. That is, a flat part D1 appears between contiguity pulse wave forms, and one-beat before at the time of the appearance of this first flat part is DBP. Moreover, although the pulse wave form D becomes small with the rise of cuff pressure E, among those it disappears, it is SBP one beat before this pulse wave form D is extinguished.

[0021] In addition, although it is the configuration of differentiating the digital signal changed with A/D converter 18 by the differential circuit 61 in CPU19, you may make it prepare a differential circuit between amplifier 17 and A/D converter 18 in said said example.

[0022]

[Effect of the Invention] According to the sphygmomanometer using the cuff concerning this invention, and this cuff pressure, so that clearly from the above explanation The inner cuff backed up by the outer cuff presses an artery certainly, and considers as an ischemia condition. A pressure sensor serves as a location which stands face to face against an artery, and, moreover, pulsation and pressure fluctuation spread exactly to a pressure sensor through the nonviscous conduction liquid in an inner cuff (incompressibility). And since vibration which it is going to spread from an outer cuff side to an inner cuff side is certainly intercepted by the oscillating shield, the blood pressure measurement exact few always of the error on measurement by the width and the arm perimeter of a cuff differing from each other becomes possible.

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DRAWINGS

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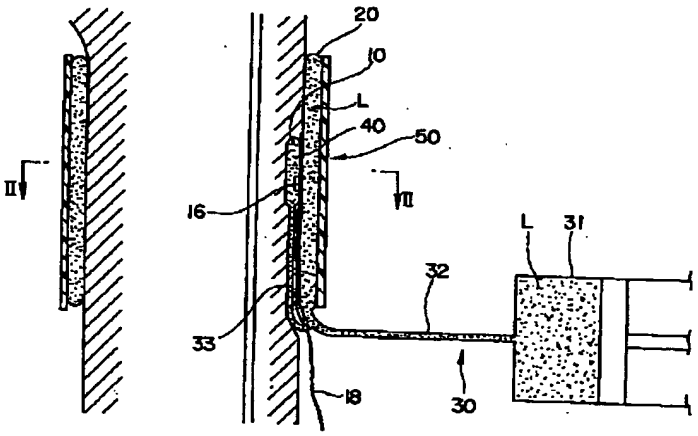
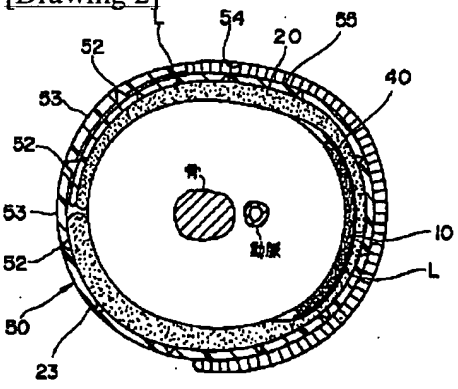
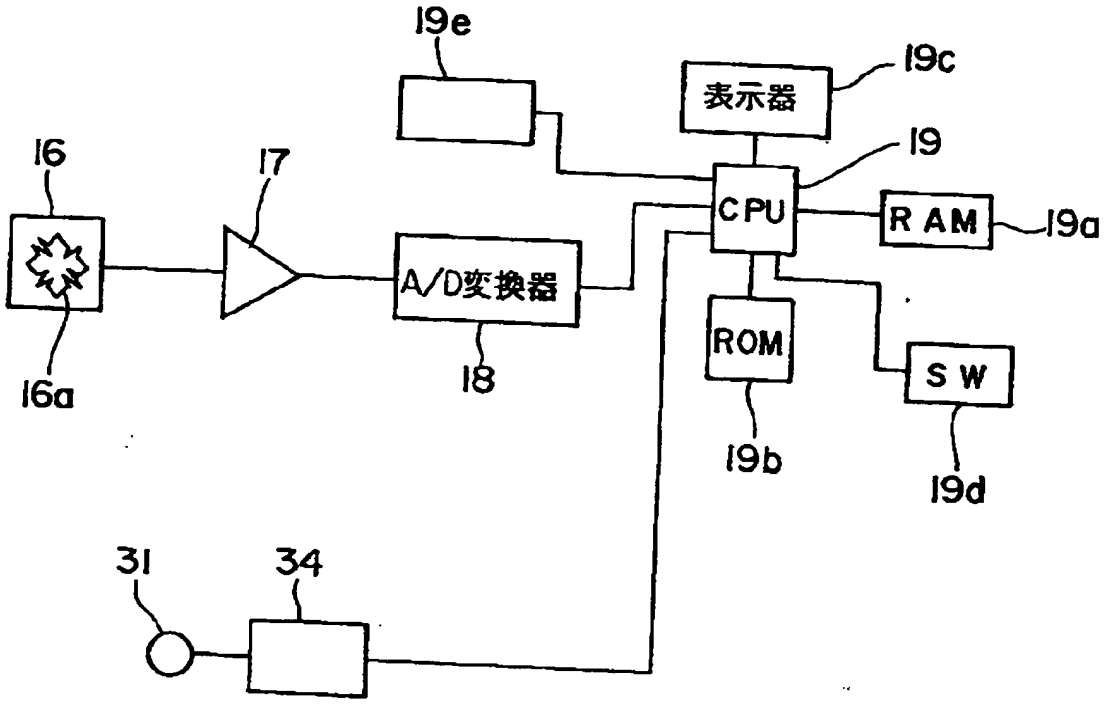
[Drawing 1]



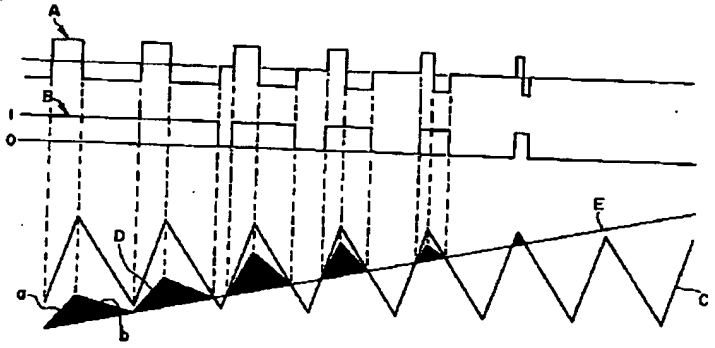

[Drawing 2]



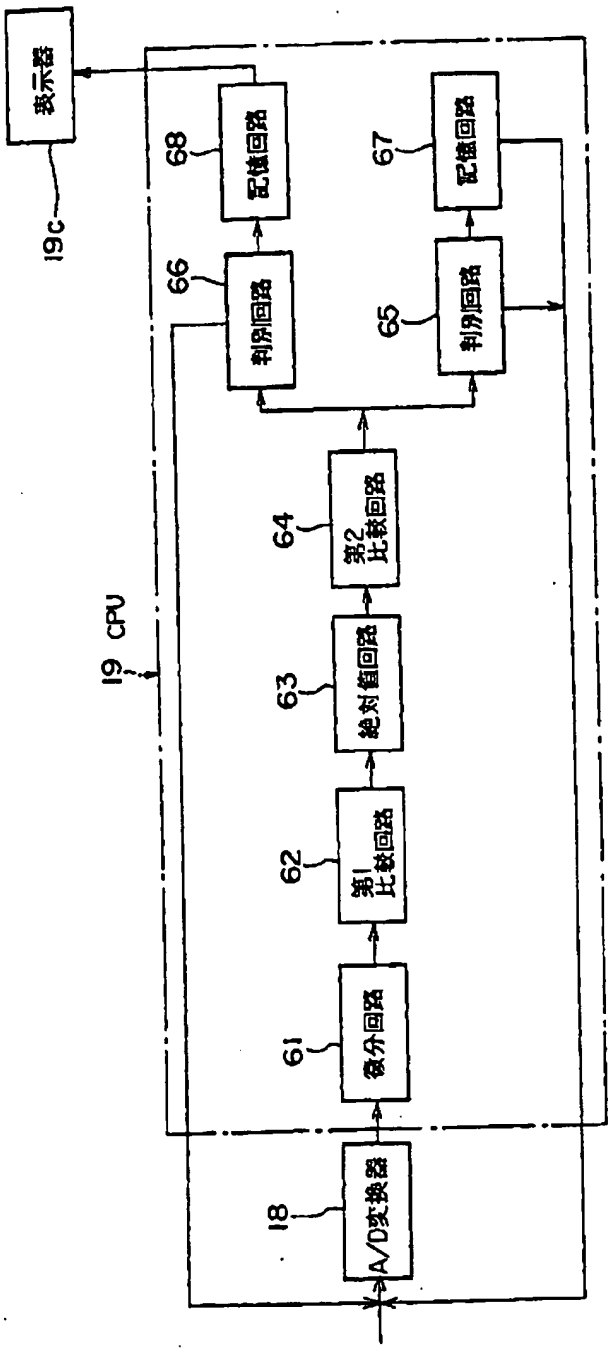

[Drawing 3]




[Drawing 5]




[Drawing 4]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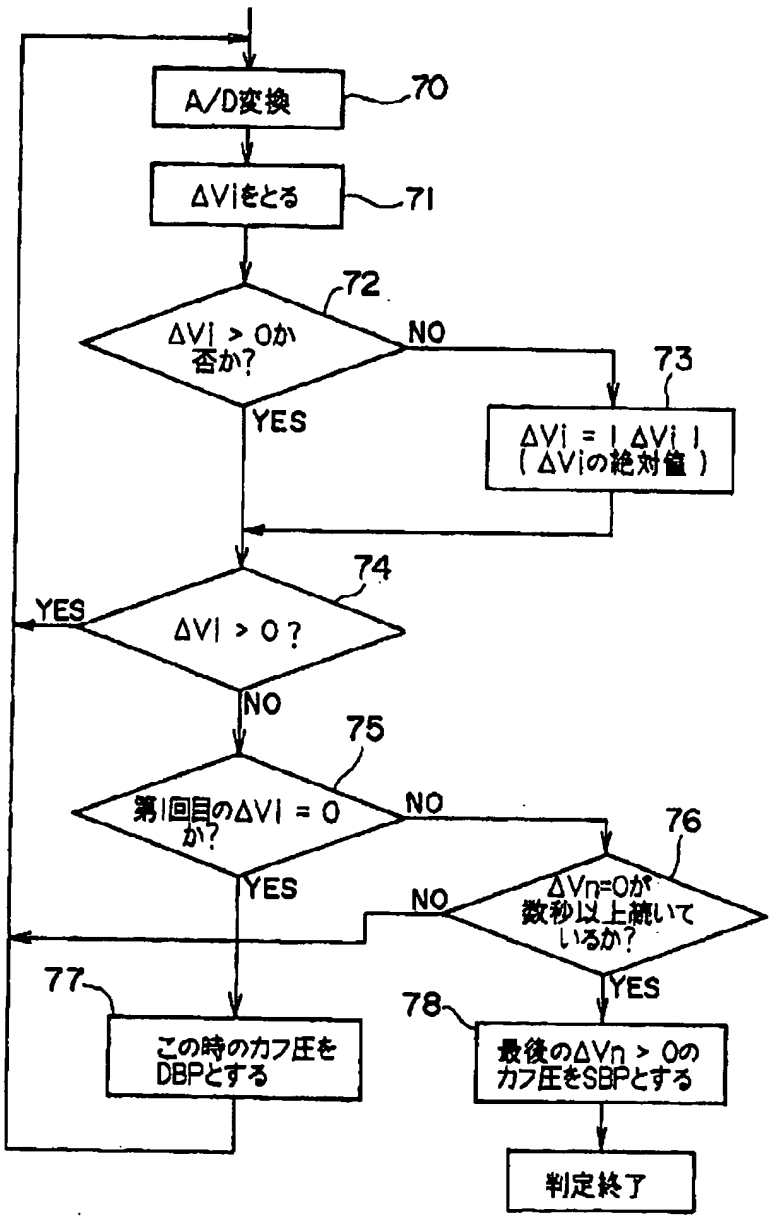
19c
19 CPU
68
記憶回路
67
記憶回路
66
判別回路
65
判別回路
64
第2比較回路
63
絶対値回路
62
第1比較回路
61
微分回路
18
A/D変換器

[Drawing 6]

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